and decomposition previously alluded to, of the sea water in the interior of the crater.

I have received from Dr. Davey, to whom I had previously expressed my opinions on the foregoing subjects, a communication coroborative of the chemical theory which I have advanced in the preceding pages.

Art. XX.—*On What Data does the City of Melbourne depend for an Adequate Supply of Water from the Yan Yean Reservoir. By* David E. Wilkie, Esq., M.D.

Several papers having been recently read before the Society on the subject of the probable supply of water derivable from Yan Yean, I think it of great importance now to inquire upon what data we depend for obtaining this supply.

I entertained the hope that the interesting questions treated of in the papers above referred to would have induced some of our scientific men to devote their attention to their elucidation; and I confess that I am rather surprised that no one seems disposed to investigate those questions further, although on a correct solution of them must depend all our hopes of securing a sufficient supply of pure and wholesome water, which would contribute so largely to our health and comfort, and the failure of which would be so disastrous to the city.

The question of evaporation, from its great importance in relation to the subject of this paper, claims our first consideration.

Our meteorological experience in this colony is very limited, and little is known with respect to the annual rainfall in different localities. Judging from the tables that have been kept in Melbourne for some years, there is reason to believe that there is considerably less rainfall in Victoria than in England. The geological features of the country are unfavourable for the production of rivers, much of the rain water being held on the surface, and lost by evaporation. Our high temperature also conduces greatly to diminish the proportion of the rain that would otherwise reach the rivers.

Thus the physical conditions of the country are very unfavourable for the preservation of water, and a great scarcity prevails in many districts. Hence the importance of arriving at a correct knowledge of the subject of evaporation, in order that, in our endeavours to preserve water in parts of the country that are ill-supplied, and to store it for the supply of towns, we may adopt such measures as are really calculated to attain these ends.

But the question of evaporation is especially important in relation to the subject of this paper, as upon its decision depends at this moment the very important question, whether the Legislative Council ought to permit the Yan Yean works to be proceeded with, or to abandon them as a hopeless failure.

It is to be regretted, however, that the subject of evaporation is very little understood, and its importance very little appreciated in this colony; and it is not a little singular that Dr. Davey's experiments and observations, which in any other country would be deemed sufficient to determine the rate of evaporation, are here regarded with distrust, and are thought to possess little practical value.

If those, therefore, whose duty it is to proclaim the truths of science, and to vindicate their paramount claim to consideration inthe conduct of our great public works, hesitate to do so, can we wonder that the members of the Legislative Council should hesitate to interfere with matters involving scientific questions which they cannot themselves resolve?

But, independently of the great public importance of having this question of evaporation satisfactorily settled, there are other reasons which induce me again to bring this subject before you. The different papers that have been read on this subject contain opinions, observations, and experiments of so opposite and conflicting a nature, that it is altogether hopeless to expect that the public will arrive at correct conclusions, unless the members of the Society can first agree among themselves.

Surely it must be possible for a body of scientific men to determine the rate of evaporation in this country, and this is really all that is wanted, in order to determine the success or failure of our water supply, derivable from Yan Yean.

It is not too much to expect from the Philosophical Society that they should be able to inform the Legislative Council what loss will be sustained from evaporation in the Yan Yean Reservoir, and I should be sorry to think that a problem of so easy solution elsewhere should be deemed either difficult or impossible here. I trust, therefore, that it will not again be said of us that we are unable to decide this question. It surely will not be regarded as very complimentary to this colony, that one of our daily newspapers should have published in its summary for England, that scientific men here were divided on the subject of evaporation, and on the deficiency that might result therefrom in the water supply of the city.

In difficult scientific questions to whom are the public and the Legislature to look, if not to the Philosophical Society? And shall it be said that they have looked to us in vain?

I am also induced on other grounds to bring this subject before you.

It will not be forgotten that Messrs. Acheson and Christy, in their report on the Yan Yean Reservoir scheme, assumed that 10·69 inches of the rainfall of the Plenty basin would be available for the reservoir, while Mr. Hodgkinson clearly showed, by a reference to Mr. Charnock and Mr. Howard, who are the best recent authorities on the subject, that with a rainfall varying from 24 to 36 inches, the available rainfall for the average surface of England varies from 4·88 inches to 5·33 inches, the mean of which is 5·20 inches, with a mean rain of 30·6 inches. Thus these gentlemen have assumed for the Plenty basin an available rainfall more than double that of England.

I had imagined, therefore, that Mr. Hodgkinson had demonstrated the fallacy of "the excessively small rate of evaporation assumed by those gentlemen," and that their enormous estimate of the available rain was "utterly at variance with the recorded observations of all other meteorologists." It appears, however, that they are by no means convinced of their error, and that they congratulate themselves in the belief that they have arrived at the very same result with Mr. Hodgkinson, only by a different method.

When the premises are so very opposite, it would be singular indeed if the conclusions were the same.

I cannot, therefore, understand how they have deceived themselves into the belief that they have arrived at the same results with Mr. Hodgkinson, unless after this singular method.

They assume double the amount of available rainfall that he does, and, at the same time, they rely on Dr. Davey's estimate of the evaporation from the reservoir, which is nine feet, while he rejects Dr. Davey's estimate of the evaporation, and assumes five feet and a half from his own observations on a pond. But they altogether forget that, while they generously leave 9,386 gallons per minute for the use of the district, he only allows 500 gallons per minute, or an equivalent to eight inches in the reservoir, which is less than one-eighteenth part of what they allow; and they also forget that a mere coincidence in their results proves nothing in their favour; on the contrary, when similar results are obtained from data which are altogether dissimilar and contradictory, it rather proves that both the premises and the conclusions are alike unworthy of confidence.

I could readily understand how Messrs. Acheson and Christy might be right and Mr. Hodgkinson wrong, or *vice versa,* but I cannot imagine how both could be right. If Mr. Hodgkinson is correct in assuming five inches as the highest reliable amount of the available rainfall in the Plenty basin, then most assuredly Messrs. Acheson and Christy are egregiously wrong in assuming 10·69 inches, or more than double that amount; and if they are right in relying on Dr. Davey's experiments and observations on evaporation, then, in like manner, Mr. Hodgkinson is wrong in rejecting Dr. Davey's estimate of nine feet, and prefering his own of five and a half feet.

I have thought it necessary to notice this supposed coincidence, because it is very probable that many persons may be deceived by it. Most people are satisfied with merely looking to the results in any inquiry, without examining the data or calculations on which they are founded, and, in this instance, being so positively assured of a very abundant supply of water in two different ways, they will regard the supply as all the more certain on that account, and will be contented to have it either way.

It is far more correct, therefore, to infer that both are wrong than that either is right, since each denies and controverts the premises of the other; and it is altogether a fallacy to suppose that the similarity of their results will be of any avail in securing a more certain or abundant supply of water.

And I trust to be able to show in this paper that no confidence whatever is to be placed either in theoretical estimates of the available rainfall of the Plenty basin, or in experiments on evaporation conducted on ponds and waterholes, but that actual measurements of the river, and Dr. Davey's estimate of the evaporation are alone to be depended on in deciding the important question whether the Yan Yean Reservoir scheme ought to be proceeded with, or altogether abandoned.

This leads me to notice the confusion that seems to arise from the use of the term "available rainfall." As applied to the Plenty basin it has no intelligible meaning, because many thousand acres, according to Mr. Hodgkinson, are so swampy that there is not only no available rainfall from them, but they evaporate and absorb a large proportion of the available rainfall of the rest of the basin, which is thus rendered no longer available, although it forms a portion of the rainwater that is shed from the drainage area. Therefore the expression available rainfall very incorrectly conveys the meaning that is intended, and is of little use in any scientific inquiry.

To obviate this difficulty I have made use of the term "watershed" to signify the proportion of the rain that is shed from any given area or tract of country. This term has been ordinarily applied to the area or tract of country that sheds water, but this is so gross a corruption of the analogies of the English language, that I have avoided using it in this sense.

At the time that my paper on the Failure of the Yan Yean Reservoir was published, I had only heard Mr. Hodgkinson's paper read, and, on its subsequent publication, I was much surprised to find that I had misunderstood him in several important points.

While, therefore, I still regard his paper as a valuable contribution to practical science, I regret extremely to add, that I am compelled to differ from him very materially in some of the scientific data upon which he bases his conclusions.

Mr. Hodgkinson himself admits the necessity of throwing more light on the question of evaporation, "in order that definite conclusions relative to the probable supply of water derivable from Yan Yean might be arrived at;" and the extraordinary discrepancy of opinion that prevails on the subject clearly shows that, until this question is determined by scientific investigation, no definite conclusions can be arrived at.

I proceed now to consider what are the grounds upon which Mr. Hodgkinson bases his confident opinion, that there will be a very abundant supply for a population nearly three times greater than the present population of Melbourne, while I have myself found, by a strict method of investigation, based on actual measurements of the river, that, after deducting the loss that is at present sustained from evaporation in the marshes, and the probable loss from evaporation in the reservoir, according to Dr. Davey's estimate, there will be no water for any population.

Mr. Hodgkinson's theoretical estimate of the watershed of the Plenty basin differs very little from my own. In deducing the watershed from English data, I assumed four-and-a-half inches as the nearest approximation, while he assumes five inches. The difference therefore amounts to half an inch or one-tenth, which is equal to one foot in the reservoir.

How is it then that he is enabled to find a very abundant supply for 191,500?

The following table gives Mr. Hodgkinson's calculations reduced to feet, in the reservoir of 1,450 acres.

Supply.

	Feet.	In.
5 inches available rainfall over 62½ square miles, equal to 40,000 acres	11	6·16
7 inches ditto over drainage area of reservoir, equal to 3,000 acres	1	2·48
Rainfall on reservoir of 1,400 acres 32 inches. Dew 10 inches	3	4·55
Total	16	1·19

Demand.

	Feet.	In.
Amount lost in the swamps	2	5
Left to maintain the flow in the river, 500 gallons per minute		8
Evaporation 66.6 inches over 1,400 acres	5	4·33
Loss of flood water, and loss from absorption, equal to 6 inches over 1,400 acres		5·79
Balance equivalent to supply 191,500, at 40 gallons	7	0·52
Total	15	11·64

1. From the above table it will be observed that Mr. Hodgkinson assumes 5 inches over 62½ square miles, instead of 4½ inches over 60 square miles, and in this way gains 1 foot 7 inches.

2. He only leaves 500 gallons per minute, or 8 inches in the reservoir, for the use of the district, instead of 900 gallons, or 14 inches, and thus gains 6 inches.

3. He assumes that the whole of the available rainfall, less 500 gallons per minute, will be available for the reservoir; whereas, I thought it unsafe to rely on any estimate deduced from English tables, and preferred an estimate based on the measurements, which leaves a balance of 1 foot 5½ inches in his favour, and which I considered unsafe to rely on.

4. He assumes that 10 inches of dew will be condensed on the surface of the reservoir, whereas I only allowed 2 inches, and in this manner he gains 8 inches.

5. He assumes the evaporation in this colony at 5 feet 6·6 inches, rejecting Dr. Davey's estimate of 9 feet, and thus gains 3 feet 4 inches.

These amounts will stand thus:—

			Ft.	In.
1.	Difference	between 5 inch of rain over $62\frac{1}{2}$ square miles and $4\frac{1}{2}$ in. over 60 sq. m. ...	1	7
2.	"	between 500 gallons and 900 gallons ...		6
3.	"	between my two estimates and not relied on	1	$5\frac{1}{2}$
4.	"	between 2 and 10 inches of dew ...		8
5.	"	between 5 feet 6·6 inches of evaporation and 9 feet	3	4
		Total	7	$6\frac{1}{2}$
		Deduct loss of flood water, and loss from absorption		6
		Balance to supply 191,500	7	$0\frac{1}{2}$

This table, then, exhibits the data on which depend all our hopes of an adequate supply of water from Yan Yean.

If Mr. Hodgkinson is right in assuming these data, we shall have a very abundant supply, at least for our present wants. If, on the other hand, I shall succeed in showing that he is wrong, then, assuredly, the Yan Yean scheme will prove a failure, and we shall have to look elsewhere for our water supply.

Having been induced, on public grounds, to investigate the points upon which Mr. Hodgkinson differs from myself, I trust that, in freely expressing my opinions on our points of difference, he will give me credit for simply wishing to arrive at the truth, and, as the question at issue is a most momentous one for the public interests, both in a pecuniary and in a sanitary point of view, I trust that he will see no impropriety in my calling in question his opinions on subjects which he himself admits require further elucidation.

1. What reason does Mr. Hodgkinson assign for assuming 5 inches of the rainfall, instead of 4 inches or 6 inches?

This is a very important question, as one inch over $62\frac{1}{2}$ square miles will supply 62,500, at 40 gallons per head, per day.

The evaporation tables of Mr. Charnock, the Vice-President of the Meteorological Society, and Mr. Howard, have, according to Mr. Hodgkinson, been chiefly relied on of late years, in estimating the proportion of the rain that is available for water supply in England.

The available rain, according to Mr. Charnock, is 4·88 inches out of a rainfall of 24·6 inches, and according to Mr. Howard the proportion is 6·53 inches out of 36 inches. Mr. Charnock's observations have reference to a previous well-drained soil in Yorkshire, Mr. Howard's apply to the average surface of England; and it is interesting to remark that the observations of these gentlemen corroborate the previous observations of the late Dr. Thomson, of Glasgow, who estimated four inches as the watershed of Great Britain, from observations and measurements of the Clyde.

It is to be regretted that Mr. Hodgkinson has not clearly stated on which authority he has based his estimate of five inches, or the precise method by which he has arrived at this very important conclusion.

He describes Mr. Charnock's observations as the most extensive and minutely accurate ever made in Britain, but they apply only to the Eastern Counties of England, where the rainfall averages twenty-four inches. They also apply exclusively pervious well drained soil, and are, therefore, not applicable to impervious undrained lands, which receive and evaporate a large portion of the watershed from lands that are pervious and well drained. Mr. Charnock's estimate is, therefore, too high for the average surface of England, and, with a mean annual rainfall of thirty-six inches, would give seven inches instead of five and a half inches, which is Mr. Howard's estimate.

It would be clearly wrong, therefore, to assume Mr. Charnock's proportion of available rain, for pervious and well-drained land in Yorkshire to determine the watershed of the Upper Plenty, where there are many thousand acres of impervious and undrained lands; and, in computing the proportion of the available rain for the average surface of England, Mr. Howard has no doubt made the necessary deduction from Mr. Charnock's estimate. Hence, while the estimate of the latter is one-fifth of the rain, that of the former is only one-sixth, and Dr. Thomson's estimate for Great Britain, excluding dew, is one-eighth.

The mean rainfall for Melbourne, for a period of six years, has been found to be 30·85 inches, and Mr. Hodgkinson seems to have adopted this proportion of rain for the Upper Plenty, as he regards the rainfall and dew taken together, as equivalent to thirty-six inches.

Without any correction, therefore, for temperature or dryness of the atmosphere, Mr. Charnock's proportion of the available rain would give 6·11 inches for the Upper Plenty, and Mr. Howard's 4·73 inches.

On what principle, then, does Mr. Hodgkinson adopt five inches to represent the watershed of the Plenty basin?

He says, "I believe, therefore, that the proportionate amount of the rainfall available in the Upper Plenty district is less than the English proportion. From the want of extended meteorological observations taken in connexion with the Upper Plenty districts, or, what would have been much more satisfactory, a complete series of stream guagings to determine the annual discharge, the available rainfall of the district can only be analogically eliminated from the general data afforded by the most trustworthy English observations on evaporation, corrected for the average differences of temperature, for the various months in the year, in London and Melbourne, as given in the *Statistical Register for Victoria.* Moreover, as wind and the hygrometrical state of the atmosphere exercise a marked influence over evaporation, independently of temperature, and as their action is more intense here than in England, some additional corrections must be applied to the English data for this increased action. Having made due allowance for all these contingencies, I have arrived at the conclusion that the total annual rainfall and dew at the Upper Plenty may be taken together as equivalent to thirty-six inches, and that the amount thereof available for the supply of the Plenty, in the present state of the natural surfaces, would be about five inches."

I entirely concur with the opinions expressed in the above paragraph, but, in adopting for the Upper Plenty district a larger proportion of available rainfall than is relied on for the average surface of England, Mr. Hodgkinson has altogether forgotten the principles which he has so ably inculcated.

He admits that the proportion of the rainfall in the Upper Plenty district ought to be less than the English proportion: Why does he not, therefore, adopt less than the English proportion? He admits the want of meteorological observations, and that measurements of the river would have been much more satisfactory: Why does he not base his calculations on the December measurements, making due allowance for the winter rains?

He tells us that his estimate of the available rainfall of the Upper Plenty District is only analogically eliminated from English data, corrected in a very complicated manner for temperature and dry winds. How is it then that he places such implicit confidence in an estimate so singularly enveloped in difficulties and uncertainties, and applied under novel circumstances to a new country, with a totally different climate? And after all he has not made the corrections to which he attaches so much importance. He has adopted a less proportion of available rain than Mr. Howard's, which is relied on as correct for the average surface of England, and Mr. Charnock's tables, which are alone applicable to previous well-drained lands, give only 6·11 inches as the proportion of available rain for the Upper Plenty District, and 6·11 inches, if duly corrected in the manner described by Mr. Hodgkinson, would give considerably less than four inches. I am at a loss, therefore, to discover by what method he has arrived at his conclusion that five inches of available rain represent the watershed of the Plenty basin. There is nothing in his reasoning to show why he should not rather have adopted four inches, but the reverse.

If he has adopted Mr. Charnock's proportion of 6·11 inches, then he has allowed 1·11 inches for all the contingencies to which he refers, and he has given no reasons why he should not rather have adopted Mr. Howard's proportion, which gives, without any correction for temperature, only 4·73 inches, for the rainfall of the Upper Plenty. And, as it appears to me, Mr. Howard's proportion for England, with adequate correction for difference of climate, is the only safe proportion from which to deduce the watershed of the Plenty basin.

I have not had an opportunity of correcting either Mr. Charnock's or Mr. Howard's tables of evaporation, for difference of temperature, but I have in the following tables corrected Dr. Dalton's precisely in the manner explained by Mr. Hodgkinson, and Dr. Dalton's estimate of available rain for England, which is 8·41 inches, when thus corrected gives exactly 4·54 inches as the proportion of available rain for our climate, without any correction for our very dry atmosphere, for which half an inch in addition may be very safely allowed. Thus the conclusion is inevitable that the tables of Mr. Charnock, and Mr. Howard, if similarly corrected would give a still less result.

Admitting, therefore, that Mr. Hodgkinson is right in assuming Mr. Charnock's proportion of the available rain as applicable to the Upper Plenty district, I do not think that he has advanced any good reasons to show that the difference in the evaporation of the two countries is so small, as to warrant the very small allowance he makes for the differences of climate, in adopting five inches.

In my former paper I expressed a very decided opinion that no confidence could be placed in theoretical estimates of the watershed of the Plenty basin, deduced from English data, at the same time, as a subject of scientific interest, rather than of any practical value, I assumed Dr. Dalton's estimate of 8·41 inches as the average watershed for England, and by correcting this amount for the difference of temperature, I concluded that four and a half inches would represent an approximation to the watershed of the Plenty basin.

TABLE I.—Showing the Mean Rain, the Mean Temperature, and the Proportion of the Rain evaporated, and the Watershed, and the Evaporation from Water in the different months in England, according to Dr. Dalton's tables.

	Mean Rain.	Mean Temp.	Evaporation. From Land.	Evaporation. From Water.	Watershed.
	Inches.	Degrees.	Inches.	Inches.	Inches.
January	2·46	36 09	1·01	1·50	1·45
February	1·80	36·75	0·53	2·00	1·27
March...	0·90	42 65	0·62	3 50	0·28
April	1 72	47·57	1·49	4 50	0·23
May	4·18	55·26	2·69	4·96	1·49
June	2 48	60 68	2·18	6·49	0 30
July	4·15	63 17	4·09	5·63	0 06
August	3·55	62 78	3·38	6·06	0 17
September ...	3·28	57·00	2·95	3·90	0 33
October	2 90	50 37	2·67	2·35	0 23
November... ...	2·93	43 12	2 05	2 04	0 88
December... ...	3·20	40·09	1·48	1·50	1·72
	33 55		25·14	44·43	8·41

TABLE II.—Showing the Mean Rain, the Mean Temperature, and the Proportion of the Rain evaporated, and the Watershed, and the Evaporation from Water in Victoria, deduced from Dr. Dalton's tables, allowing the same evaporation to the same mean temperature in both countries.

	Mean Rain.	Mean Temp.	Evaporation. From Land.	Evaporation. From Water.	Watershed.
	Inches.	Degrees.	Inches.	Inches.	Inches.
January	1·36	67·94	1·34	8·00	0·02
February	0 95	67 31	0·93	8·00	0·02
March	1·60	63·92	1.57	6 49	0·03
April	3·13	60 56	2·75	6·49	0 38
May	3 67	54 91	2 36	4·96	1·31
June	2·41	51·00	2·21	4·50	0·20
July	2 18	49 34	1·88	4 50	0·30
August	3·61	50 66	3·32	4·50	0·29
September ...	3·27	55 08	2·10	4 96	1·17
October	2·54	58·97	2·28	4·96	0·26
November... ...	4 27	62·25	3·74	6·49	0 53
December... ...	1·86	66·29	1·83	8·00	0·03
	30 85		26 31	71·85	4 54

The above tables show that my conclusion is arrived at in the manner described by Mr. Hodgkinson, and if a further correction of half an inch be made for our drying winds, four inches will represent the watershed as accurately as such a method of calculation will permit of.

I think I am warranted, therefore, in concluding, that if we must place confidence in any estimate analogically eliminated from English data, we are not warranted in assuming a larger proportion of available rainfall for the Upper Plenty district that four inches.

From Mr. Hodgkinson's estimate of 11 feet 6·16 inches, we must therefore deduct one-fifth, or 2 feet 3·63 inches, which is equivalent to supply 62,500 at forty gallons per head per day.

I also object to assuming sixty-two and half square miles as the area of the Plenty basin.

Messrs. Acheson and Christy in their report thought it safer to assume sixty square miles, and I followed their example in my estimate.

This area has never been thoroughly surveyed, indeed the greater portion of the boundary line has never been visited by any surveyor, being covered with an impenetrable scrub, and many thousand acres, according to Mr. Hodgkinson, consist of swampy and undrained lands, which are not only useless as affording no watershed, but they evaporate the watershed of many more thousand acres which drain into them. As it was of great importance to arrive at a safe and reliable result in this investigation, I think Mr. Hodgkinson erred in assuming sixty-two and half square miles, and for the reasons which I have assigned, I think it will be readily admitted that it was much more correct to have assumed sixty square miles as the area of the Plenty basin.

On this account, therefore, I have to deduct from Mr. Hodgkinson's estimate 4·60 inches in the reservoir, which is equivalent to supply 10,454.

2. Mr. Hodgkinson only allows 500 gallons per minute for the use of the district, and to maintain the flow in the river, and this is only equal to eight inches in the reservoir. Messrs. Acheson and Christy in their report allow twelve feet four inches for the same purpose; so that they allow eighteen and half times the amount that he allows.

They allowed this amount on the understanding that the Commissioners of Sewerage and Water Supply had entered into an arrangemeut with the resident population not to abstract more than one-half of the river, which was to be allowed to flow for twelve hours out of twenty-four.

What will they say to the small amount accorded them by Mr. Hodgkinson? If his estimate of the discharge of the river is correct, he only allows one-seventeenth part to remain, and abstracts all the rest for the reservoir.

In this I feel persuaded that Mr. Hodgkinson has also erred, and there can be no doubt that if the Commissioners should ever attempt to carry out his recommendation they would find themselves overwhelmed with legal actions, and would be compelled to make very heavy compensation to all those whose interests might be affected by the loss of the river.

In my estimate I allowed 900 gallons per minute, or one-third of Mr. Blackburn's December measurement of the river at Yan Yean, and an idea of the smallness of even this amount may be got by reflecting on the circumstance, that, during the drought of 1851, when the Plenty had very nearly ceased to flow, Mr. Blackburn's measurement in February gave 865 gallons per minute.

I think, therefore, that it will be readily admitted that at least six inches must be deducted from Mr. Hodgkinson's estimate on this account, and six inches will supply 13,656.

3. I have stated that I have no confidence in theoretical estimates, and this is the reason that I preferred my estimate, that was based on measurement to that which I computed at four and half inches of the rainfall, merely as an approximation from English data, hence I allowed the difference amounting to one foot five and half a inches in the reservoir, as a margin for casualties.

In my preceding remarks it is, I think, clearly shown that I was wrong in assuming four and a half inches, and that I ought to have assumed four inches of available rain as the best approximation that can be arrived at from the most trustworthy English data. There is thus a difference of only 6·43 inches between the two estimates, and there can be no objection to leave this small amount for casualties, and, therefore, it may be deducted from Mr. Hodgkinson's estimate; but as he has allowed six inches for loss of flood water and from adsorption, I shall regard the 6·43 inches as an equivalent for his six inches.

4. I come now to consider the subject of dew. I explained in my former paper that very little dew could be condensed on the surface of water, and I allowed two inches only because it was my firm conviction that, even without drawing off any water from the reservoir, there would often be very little in it; and when the water is very shallow, a small quantity of dew may possibly be condensed on the surface in very cold

and frosty nights, and I was anxious that the reservoir should get every possible advantage.

I must say, therefore, that I was greatly surprised to find that Mr. Hodgkinson relied on ten inches of dew for the reservoir.

I have looked in vain for any authority to bear out this extraordinary opinion respecting dew, and I feel assured that Mr. Hodgkinson could not have consulted the best authorities on the subject.

In England, from four to five inches of dew are supposed to be condensed on the surface of the ground, and its production is easily explained, and well understood.

But Mr. Hodgkinson obtains ten inches for the reservoir, by assuming that this amount of dew is condensed on the surface of water in this colony.

This is a very important assumption, as ten inches in the reservoir will supply 22,727, at forty gallons, per head, per day, and 100,000 at nine gallons, which some allege is really all that is required for ordinary consumption. At this rate the dew condensed on the surface of the reservoir would suffice to supply Melbourne, with all its suburban towns and villages.

Here, again, it is to be regretted that Mr. Hodgkinson does not say upon whose authority he assumes this enormous amount of dew. He certainly states that Mr. Thom, the eminent practical engineer of the Paisley Water Works, and the energetic promoter of the gravitation schemes of water supply in Scotland, considers that the evaporation in large reservoirs is counterbalanced by the condensation of dew, but this is only to be regarded as his individual opinion, and is certainly not based on accurate observation, or experiment.

It is scarcely possible that Mr. Thom could have directed much attention to the subject of dew at the time that he uttered this opinion, and Mr. Hodgkinson himself shows that Mr. Thom's statement is altogether inconsistant with the production of salt by the evaporation of sea water, which has been carried on for ages.

Mr. Thom's opinions, therefore, on scientific subjects are not very remarkable for their minute accuracy.

Mr. Hodgkinson quotes his estimate of the available rain on which he relies for the Paisley Water Works, which is thirty-nine inches out of an annual rainfall of fifty-four inches. I can readily understand how low swampy ground, that is thoroughly intersected with catch-water drains, should yield a much larger amount of water than the whole rainfall, because such lands often drain large tracts of country, but I cannot understand how Mr. Thom should imagine that fifty-four inches of rain fall in Paisley. This town is only seven miles distant from Glasgow, and, according to the meteorological tables, the rainfall for this city is twenty-one inches.

Mr. Thom's observations and experiments, therefore, could not have been conducted with much regard to scientific accuracy, when he computes the available rainfall at thirty-nine inches out of an annual rainfall of twenty-one inches, and they contrast rather singularly with Dr. Thomson's observations and experiments, which give four inches of available rain out of twenty-one inches for the Clyde district.

Since Dr. Wells published his well known Essay on Dew, his theory of its formation has been almost universally received as correct.

The production of dew occurs in the following manner. The quantity of aqueous vapour that can exist in the atmosphere depends entirely on temperature.

During a clear calm night, all bodies that are fully exposed in the air become more or less rapidly cooled by radiation of heat from their surface. The air in contact with such bodies suffers a corresponding loss of heat, and, as soon as its temperature reaches the dew point, the moisture, which can no longer retain the form of vapour, is condensed in the form of dew. Thus, those bodies which radiate most heat and conduct least, condense most dew, and it is found that all bodies which are good conductors and good reflectors of heat from their surface, are bad radiators.

The metals, therefore, condense dew very sparingly. Water, though a bad conductor of heat when applied to its surface, is from the extreme mobility of its particles, the most rapid conductor of heat and cold, when these are applied with due regard to its peculiar laws.

Water in this sense may be regarded as strictly analogous to the metals, and, being a good conductor and reflector of heat, it is necessarily a bad radiator, and the dew is not formed on any surface whose temperature is not cooled by radiation below the dew point, which ranges from 5° to 20° below the temperature of the air. Unless, therefore, the surface of water be cooled by radiation below the dew point, it is quite clear that no dew can be condensed but its density, which varies with every change of temperature, and its fluidity operate to prevent any reduction of its temperature until the whole mass is similarly affected.

The temperature of water is thus very slowly reduced by radiation, because, as soon as the surface particles lose any portion of heat, their density is at the same time increased, and they sink to a lower level, being replaced by warmer particles from underneath.

Thus water differs most materially from grass and other vegetable bodies whose power of radiation is very great, and which therefore cool very rapidly, and being very bad conductors, the heat that is lost by radiation is very slowly restored from the ground. Hence in clear calm nights they condense dew in great abundance.

The greater the depth of water, the more slowly is its temperature diminished, as the surface cannot lose even 1° of heat until the whole depth has been reduced to the same temperature. And in this dry climate the dew point or point of saturation is often many degrees below the temperature of the air. It is thus easy to see that when there is a depth of more than a few inches of water no dew can be condensed on its surface.

But we are not left to determine this point by reasoning on general principles. It is fortunately one that can very readily be determined by experiment.

Dr. Wells found that a thermometer laid on a grass plot in a clear night, and in calm weather, sunk 6°, 8°, 13°, and even 20° lower than a thermometer hung at some height from the ground. This explains the rapid extraction of heat from the atmosphere in contact with the grass plot, and the copious deposition of dew on grass. But no such rapid reduction of temperature has ever been observed in water placed under similar circumstances. The surface of the ocean and inland lakes retains a very uniform temperature, corresponding to the seasons, and suffers little change from the ordinary alternations of heat and cold during day and night; indeed the difference in the temperature of the ocean is scarcely perceptible.

In temperate regions, the difference in the diurnal range of the thermometer in the air over the ocean is very trifling, rarely exceeding from 4° to 6°, while upon the continents the range often amounts to 20° or 30°, and between the latitudes of 25° and 50° the air is rarely warmer than the surface of the sea. And it is found by careful observation that while the temperature of the air over the land is rapidly cooled by the chilling influence of radiation during the night, the air over the ocean is several degrees colder than the surface of the water, and is therefore heated, not chilled, by contact with its warmer surface.

With cold winds the temperature of our inland lakes would be much more quickly cooled than by radiation; but for the formation of dew it is necessary that there should be scarcely any wind. It is also necessary that the water should abstract heat from the air, and not that the air should abstract heat from the water.

Dr. Wells also clearly proved by his experiments that water fully exposed in a calm clear night in shallow vessels lost weight from evaporation, while dew was being largely deposited on the surface of the ground. An increase of weight from condensation of dew was only observed when the cold was so great that ice was formed, and in this case he found a slight increase in weight, but the existence of ice proved that the temperature of the water had been reduced far below the dew point.

I am not aware that any subsequent experiments have shown any inaccuracy in the experiments of Dr. Wells.

It is to this uniformity in the temperature of water during day and night that our land and sea breezes are owing. During the day, the air over the land becomes heated, and a sea breeze is the result; during the night, the land is chilled by radiation, and the air being thus rendered much colder and heavier than that on the surface of the ocean, a land breeze is the result.

In this manner, the extremes of heat and cold are very much moderated along the coast lines, and the climate is rendered much milder and more agreeable.

There can be no doubt that like atmospheric currents will take place at Yan Yean. The heated surface of the surrounding ranges, during the day, will produce currents of cool air from the reservoir. During the night, the warmer air on the surface of the reservoir will give place to currents of cold air which has been deprived of its moisture by the chilling influence of radiation on the summits and slopes of the ranges.

Mr. Hodgkinson's theory, would, however, reverse the whole order of things.

If the surface of the sea and our inland lakes becomes during the night so much colder than the surface of the land as to condense double the amount of dew, we should have land breezes in the day, and sea breezes in the night; and our summer watering places would become inhospitable deserts.

But as it is physically impossible for our inland lakes to lose from 5° to 15° of temperature by radiation during the night, so it is physically impossible for any dew to be condensed on their surface.

And I feel persuaded that Mr. Hodgkinson could not have reflected sufficiently on the general principles which regulate the production of dew, otherwise he would certainly have omitted it altogether from his calculations, and his extreme confidence in a very abundant supply for 191,500, would have been considerably diminished.

And there can be no objection to my deducting ten inches from Mr. Hodgkinson's estimate, or an equivalent to supply 22,727.

But there is another view of the subject equally fatal to the assumption of ten inches of dew. Mr. Hodgkinson has calculated the evaporation from the surface of the reservoir from English data. Now, these data represent the amount of water evaporated, as determined by actual measurement, without any reference to dew, the condensation and evaporation of which on the surface of the evaporating vessels are regarded as balancing each other. Therefore, if ten inches of dew are assumed to be condensed on the surface of the reservoir, this amount must be added to the rate of evaporation deduced from English data. But Mr. Hodgkinson has not done this, he has allowed one inch for the three summer months in estimating the evaporation of the pond, but it does not appear that he has added nine inches for the other nine months.

If he has done this, his estimate of the evaporation, excluding dew, would be four feet 9·6 inches for twelve months, which it will surely be admitted is a very small allowance for this country, when Dr. Dalton's estimate for Manchester is three feet eight inches, and Mr. Glaisher's estimate for Greenwich is four feet two inches.

If Mr. Hodgkinson, therefore, insists on retaining ten inches of dew in his estimate, he cannot object to add nine inches to his evaporation, which will thus amount to six feet 3·6 inches; but in this case the dew goes for nothing.

5. I have thus far endeavoured to show that very large deductions must be made from Mr. Hodgkinson's estimate, ere we arrive at the amount that will be available for the supply of the city; and his estimate for 191,500 has been reduced by an amount that would supply 109,337, leaving still sufficient for 82,163.

I now proceed to consider what dependence is to be placed on the amount gained by Mr. Hodgkinson, from prefering his own estimate of the evaporation from the surface of the reservoir, which is five feet 6·6 inches, to Dr. Davey's which is nine feet.

This difference for an area of 1,450 acres is three feet four inches, and will suffice to supply 90,909, at forty gallons per head, per day.

The experiment on which Mr. Hodgkinson relies to prove the evaporation from the surface of water, during three of our summer months, has many singular features.

It was conducted on a pond on the banks of the Yarra, very little above the sea level, and, therefore, in the most favourable position to receive a lateral supply from higher levels. Again, decomposed trap resting on stiff clay is exceedingly favourable to retain the winter rains from higher levels, and to afford a large lateral supply to a pond fifteen feet deep.

It cannot be doubted that a large amount of water may be supplied in this way.

In many parts of Melbourne, and particularly at the lowest levels, it is almost impossible to prevent the cellars being filled with water. And, on the Gold-fields, the difficulties that the diggers have to contend with from influx of water at low levels, and in deep excavations, is well known.

In selecting this pond for an experiment on evaporation, especially when the justification of a vast expenditure of public money depended on the result, it was incumbent on Mr. Hodgkinson to show that it contained no springs, and that there was no other indefinite source of supply that could render the experiment fallacious.

Springs are very often found in the ponds and water-holes that form the beds of many of our creeks. This is a well ascertained fact, and was therefore deserving of careful consideration.

In some instances the springs gush out of the rocks above the water line, but, in general, they are principally distinguished by the small apparent loss from evaporation in those ponds in which they exist.

The difference in this respect is very remarkable, where there are chains of ponds all those without springs dry up during the summer months, and I have been assured by old colonists, and residents on the Deep Creek, and other creeks, that many of the ponds have from four to six feet of water in them in November, and that they dry up completely in three or four months.

Nor can this be accounted for by any loss that might be sustained from cattle drinking at them. Where there are continuous chains of ponds it would be difficult to understand how so many should be emptied in the same manner, and, where all are equally accessible, how some should be emptied by cattle, while others, apparently, lose very little water.

And this objection cannot apply to my observations with reference to the Deep Creek, as the land is enclosed for cultivation.

The water of these ponds is lost, therefore, either by evaporation, or absorption. Either admission would be alike fatal to the prospects of the Yan Yean Reservoir.

If so much water can be absorbed through the slate strata which form the bed of the Deep Creek, what reasonable grounds have we to expect that the same amount of absorption will not take place through the slate strata that form the bed of the reservoir?

It may be noticed that some settlers have great confidence in the Yan Yean scheme from observing that small artificial water-holes are often permanent in the summer months.

If my reasoning is correct with regard to the effects of evaporation in this country, we may assume that the evaporation from the surface of water is nine feet, and that one-ninth of the rain may be relied on as the watershed.

The extent of drainage area necessary to give a permanent supply of water to any pond can, therefore, be easily determined.

With a rainfall of thirty-six inches, the ratio of the drainage area to the surface of the pond must be greater than eighteen to one, in order to secure a permanent supply.

The ratio of the Plenty basin to the surface of the reservoir is about twenty-seven to one, but more than one-third of the watershed is not available for the reservoir, a large amount being lost in the swamps, and it being necessary to leave a certain proportion to maintain the flow in the river.

Thus the ratio is practically reduced to eighteen to one, and there is, therefore, no more than sufficient to cover the evaporation.

Reservoirs in England seldom exceed fifty acres, and they are generally much smaller, hence the loss from evaporation is very trifling, and the area of surface drained very large in proportion.

The reservoir which supplies New York is 400 acres, with a depth of forty feet, and an unlimited command of water, the loss from evaporation is, consequently, not equal to one-third of that which will be sustained at Yan Yean.

Had the Yan Yean Reservoir not exceeded 400 acres there would have been a saving of water equivalent to supply 188,500, at forty gallons per head, per day, with a depth of fifteen feet eight inches, instead of four feet four inches.

With thirty inches of rain the proportion would be twenty-one and half to one, and I have no doubt that, in all those cases in which settlers have obtained a permanent supply from artificial water-holes, the ratio of the surface drained to that of the water-holes would be found to correspond to the proportions indicated above. Nor is it difficult to understand how, with a large area and steep slopes, a small pond might be supplied even from the summer rains.

Thus, according to the evidence of gentlemen perfectly competent to describe what they have frequently observed, the evaporation from the ponds referred to is at least double what Mr. Hodgkinson observed in his pond.

I might multiply instances of a very high rate of evaporation that has been observed both in this country, and elsewhere, by gentlemen whose credibility cannot be doubted, but, at present, I merely allude to the fact forthe purpose of showing that Mr. Hodgkinson is not justified in making so momentous a question as the rate of evaporation at Yan Yean, and the whole water supply of Melbourne, depend on a single experiment on a pond, attended by many circumstances of doubt, and not conducted with that minute accuracy of detail which could alone command the confidence of scientific men, and without the most distant reference to the experiments and observations of others, who have arrived at very different results from his own.

Mr. Hodgkinson estimates the area of his pond at one and a-half acres, and the area of the surface which it drains at nine acres. The ratio is, therefore, only one to six.

And he assumes fifteen per cent. of the rainfall for the watershed, which gives 3·6 inches for the three hottest months, from a rainfall of four inches.

For the Plenty basin he has assumed 13·9 per cent. of the rain as available.

In calculating the evaporation from the pond, the 3·6 inches might have been omitted altogether.

If we refer to Dr. Dalton's table we shall find that, with a rainfall of 4·15 inches in July, 4·09 inches are evaporated, leaving only 0·06, or one sixty-ninth part, to represent the watershed.

Instead of 3·6 inches, therefore, Mr. Hodgkinson ought to have added only 0·34 inches, or one-third of an inch, as the watershed from the nine acres.

Thus 3·26 inches must be deducted from the supply of the pond, and, therefore, from the evaporation, and there only remains 20·74 inches of evaporation for our three hottest months, or 6·91 inches for each month.

This is a very important deduction from Mr. Hodgkinson's premises, as it proves one of two things. If his evaporation is right, then the 3·26 inches must be supplied from a spring, or from some distant and higher level beyond the limits of the nine acres. If, on the other hand, the rainfall of the nine acres is the only source of supply, then the evaporation for our three hottest months cannot exceed 6·91 inches. Either alternative would be sufficiently embarassing.

Dr. Davey has shown that the temperature of our three summer months, during last season, exceeded the temperature of the corresponding months in London, according to the meteorological tables of the Royal Society, by 10° of Fahr., and also that our dryness exceeded that of London by two and one-fourth to one. From these data we are warranted, according to the tables of Dr. Dalton, to compute our evaporation at nearly three times the English evaporation; but, if we are to trust Mr. Hodgkinson's experiments in the pond, our evaporation will only exceed Dr. Dalton's estimate for June by less than half an inch for each of the three months. And, if we further deduct one inch of dew, which Mr Hodgkinson has allowed for the three summer months, his estimate of the evaporation accurately deduced from his own premises, will almost exactly equal the English evaporation.

The watershed of the nine acres for twelve months, calculated at fifteen per cent. of the rainfall, is equal to 27·76 inches, which, added to the rainfall of 30·85 inches, gives four feet 10·61 inches, as the available supply for the pond, burt Mr. Hodgkinson's evaporation is five feet 6·6 inches. How is it then that the pond does not dry up? And how shall we account for a depth of ten feet of water in the summer months? It only receives four feet 10·61 inches, and it evaporates five feet 6.6 inches, the difference amounting to 7·99 inches.

The conclusion is inevitable that the balance is made up from a spring, or some other source independent of the rainfall.

And, this being proved, who is to compute the amount of water thus supplied? or what confidence can be placed in an estimate of the evaporation based on such uncertain data? Thus, to determine the amount of this lateral supply is purely an impossibility, and to assume the amount is to beg the whole question.

After the explanation given above respecting dew, it will be of no use to allege that the balance is made up in this way.

If nine inches of dew are assumed to be condensed on the pond during nine months, the same amount must be added to the evaporation, and, therefore, nothing is gained.

It is a singular fact that all our hopes of deriving an adequate supply of water from Yan Yean, at this moment, depend on Mr. Hodgkinson's estimate of the evaporation derived from the pond, and it must be regarded as still more singular that his own data, on which he relies to prove the correctness of his estimate, have furnished the best proof of its fallacy, by clearly showing that the pond is supplied from springs.

In calculating the evaporation of the other nine months, Mr. Hodgkinson has recourse to English data, and computes the amount by "correcting these for the average differences of temperature for the various months of the year," and by "applying a slight additional correction for the frequent occurrence of dry winds."

He does not say whose tables he has employed for this purpose, but, in order to illustrate the principle upon which he proceeds, I have added to the foregoing tables the evaporation from the surface of water at Manchester, according to Dr. Dalton's experiments, and also the evaporation from the surface of water in this colony, deduced from the English evaporation by allowing the same proportion to the same mean temperature in both countries.

For our three summer months I have adopted Mr. Hodgkinson's estimate of eight inches, and the result, as may be seen by reference to the tables, gives five feet 11·85 inches.

Thus it is seen that the corrections for temperature alone, give 5·25 inches more than Mr. Hodgkinson allows, after having made all the additional corrections that are necessary for our very dry atmosphere, and the more "intense action" of our very dry north winds.

But it is not necessary to adopt Mr. Hodgkinson's estimate in order to get eight inches of evaporation for each of our three summer months.

Dr. Dalton's tables give 6·49 inches as the evaporation for June in Manchester, and they also point out the method for correcting the evaporation for temperature and dryness, by a simple formula.

Now, Dr. Davey has shown that the temperature of our three hottest months is 10° higher than the temperature of the three corresponding months in London, according to the tables of the Royal Society. Thus, our increased temperature alone, without reference to dryness, would give 9·73 inches as the evaporation from the surface of water deduced from English tables, the rate of evaporation being doubled with every increase of 20° of Fahr.

But Dr. Davey has also shown that the mean dew-point of our hottest months is 50°, thus showing a dryness of 19°, or in the proportion of two and one-fourth to one compared with London.

Now, according to the formulæ of Dr. Dalton, and Dr. Ure, 9·73 inches corrected for our dryness, would give 16·22 inches for each month, or 48·66 for three months.

The above table shows that the English evaporation for the other nine months, corrected for temperature alone, is 47·85 inches.

As there are no correct data to show our relative dryness for these months, this correction must be omitted, but, even without this, the rate of evaporation deduced from English tables, in the manner described by Mr. Hodgkinson, amounts to eight feet 0·51 inches.

Thus, if we make some additional corrections for our greater dryness for the nine months, and for the more "intense action" of our dry winds, I do not see how Mr. Hodgkinson can escape from the conclusion, even according to his own method of calculation, that the evaporation from the surface of water in this colony is little short of nine feet.

In my former paper I stated, on the authority of the *Year Book of Facts for* 1854, that Mr. Glaisher had estimated the evaporation at Greenwich at five feet; I have now ascertained from his Hygrometric Tables, that his estimate is four feet two inches, so that Mr. Hodgkinson's estimate of five feet 6·6 inches for Melbourne, is very little more that Mr. Glaisher's for Greenwich, and the Greenwich evaporation when corrected for our higher temperature, would give six feet three inches without any corrections for dryness and winds.

But why does he resort at all to English data in order to deduce our evaporation in a troublesome and unsatisfactory manner? Had Dr. Dalton any peculiar method of determining the evaporation at Manchester different from that adopted by Dr. Davey in Melbourne? If it is correct to deduce our evaporation from Dr. Dalton's evaporation for the nine months, why is it incorrect to depend on Dr. Davey's evaporation for the three months?

Both these gentlemen have adopted precisely the same method of experimenting in determining their respective rates of evaporation.

Dr. Davey's experiments, which were conducted daily during the period referred to, are in every respect similar to those which are everywhere else depended on for ascertaining the rate of evaporation, and they were conducted with a degree of care and minute accuracy which it would be difficult to exceed. He carefully measured, in a graduated vessel, each portion of water that was exposed to evaporation, and thus every drop that was evaporated was accurately registered.

Those gentlemen who question the accuracy of his results ought to point out in what manner his experiments differ from Dr. Dalton's or Mr. Charnock's, and how it is that his are fallacious while they place implicit confidence in theirs.

The method commonly adopted for the purpose of throwing doubts on the accuracy of Dr. Davey's results is to compare his scientific experiments with observations on ponds and waterholes. But enough, I trust, has already been said to show that a more fallacious test could not be applied.

But, if this question must be decided by observations on ponds, I have mentioned other observations which give nearly double the amount of Mr. Hodgkinson's estimate, and I do not see in what manner he can dispose of these. And I myself measured, with the greatest care, the evaporation from the surface of a pond in the month of February, and found that there was a loss of exactly eleven inches in twenty-eight days. Now, can Mr. Hodgkinson point out any source of error in this experiment? unless it is that I omitted to add anything for rain, or dew, or lateral supply, for all of which he has made a very liberal allowance in his experiment, but this would have added to, not diminished the rate of evaporation.

The only scientific objection that has been urged against Dr. Davey's estimate being applied to the Yan Yean Reservoir is the great extent of surface. It is thought that the air will become so saturated with vapour that the rate of evaporation will be very much diminished.

There can be no doubt that in the case of the ocean this objection would have considerable weight, though, even there, extended observations show that the air is very rarely near the point of saturation; but with regard to the Yan Yean Reservoir, I feel quite certain that the effect which extent of surface would have in retarding evaporation has been greatly exaggerated,

Being surrounded by an amphitheatre of hills, it may, to a certain extent, be protected from strong winds; but, on the other hand, this physical conformation will render it more liable, in calm weather, to atmospheric currents resulting from the unequal effects of solar heat on the surface soil of the hills, and on the water of the reservoir. The latter will preserve a very uniform temperature, while the former will be subject to great diurnal alternations of heat and cold.

Thus the vapour that is formed on the surface will at all times be quickly removed, and replaced by currents of drier air. And it is important to notice, that the amount of water evaporated, other things being equal, is exactly in proportion to the surface exposed; and it it is not difficult to see that when the water is agitated with winds and currents, the extent of evaporating surface will at least be doubled.

But, independently of winds and atmospheric currents, it appears to me that those gentlemen who urge this objection have altogether overlooked the law of diffusion, which applies equally to vapour and all other gaseous bodies. In a still atmosphere, it is true that diffusion will operate more slowly than when aided by currents; but as the vapour of water is lighter than air at the same temperature and pressure, in the proportion of 62 to 100, its diffusive power is very great, even in a perfectly still atmosphere; and it may be confidently concluded that the hygrometric condition of the atmosphere and the tension of its vapour will not be materially affected by the evaporation from the reservoir, which, notwithstanding its great extent, is very limited compared with the ocean.

And, with our Australian atmosphere, which is so remarkable for its dryness, and with the rapid diffusion that will result therefrom, it would be very unwise to calculate upon a greatly diminished rate of evaporation in the reservoir.

In his estimate of nine feet of evaporation for the reservoir, Dr. Davey has made ample allowance for the retarding effects of extent of surface. His observations have only extended over four months, and the evaporation for these months is as follows:—

	Inches.
January, by approximate data	21·710
February, by daily observations	23·630
March " "	15·470
April " "	10·000

With respect to these amounts, as Dr. Davey is absent from town, and as Mr. Brough Smyth thinks that he intended to make some corrections on account of the evaporating vessel used in January and February, he advises me to assume at present, only eighteen inches for December, January, and February; the amounts for March, and April, he thinks, do not require any corrections.

Now, in computing nine feet as the evaporation from the reservoir, it is only necessary to assume sixteen inches for each of the three summer months, therefore, Dr. Davey has allowed a large deduction from the true evaporation, to compensate for the extent of the reservoir, or any other accidental canse that might operate to retard the evaporation from the surface.

What possible reason, or excuse, then, can be given for rejecting Dr. Davey's estimate of nine feet? According to my judgment the conclusion is irresistible that his estimate is confidently to be depended on, and I feel warranted in deducting the three feet four inches from Mr. Hodgkinson's estimate, which is equivalent to supply 90,909.

Having thus stated the points of difference between myself and Mr. Hodgkinson, and which constitute the data on which we depend for our water supply, and having shown that they are not based on correct or scientific principles, and are, therefore, unworthy of your confidence, and that, on a thorough investigation of the subject, there are no data to show that there will be any water for the city derivable from Yan Yean, I have little to add.

I shall submit, therefore, that the Philosophical Society has now a very important duty to perform; a duty to themselves, as the interpreters of science in this colony; a duty to the Government and the Legislative Council, who look to them for a scientific opinion to aid them in the decision of the question, if it be proper to allow the Yan Yean works to be proceeded with; and a duty to the public, whose health, and comfort, and pecuniary interests are so seriously involved in the success or failure of the Yan Yean Reservoir scheme: and I trust that the Philosophical Society will no longer hesitate to pronounce an opinion on the subject.

Art. XXI.—*Remarks on the favourable Geological and Chemical Nature of the principal Rocks and Soils of Victoria, in reference to the production of ordinary Cereals and Wine. By* Clement Hodgkinson, Esq., C. E., *Survey Department.*

Having visited the four principal Australian Colonies and been connected with agricultural pursuits in New South Wales, I have long held the opinion that Victoria will eventually produce more wheat and wine than any other Australian Colony; partly, because this territory contains the